adaptations from French or German sources, but sometimes they are "original" compilations. They are always illustrated; they come, and, what is more truly wonderful, they go, in the trade acceptation of this word. The demand for them would seem to be great—so great that few are able to resist the temptation of adding to their number, not knowing beforehand what pains of remorse are caused to the authors of such writings, in after days.

Times there were when, in the infancy of knowledge, such books as Patterson's "Zoology for Schools" and Milne Edwards's "Elementary Course of Natural History" served a useful purpose and had their day; but the rapid piling up of additions to that knowledge soon left it impossible for any single person to keep up with it, and even to write a good popular treatise on one small group of animals required the combined labour of a Kirby and a Spence. However, when the demand went on as before, the hint conveyed by such a fact was quite wasted, and the publishers took steps to meet it. Natural history for the people is now in as great favour as ever, and it must be brought out in a manner not only to attract the crowd, but it must be within their pecuniary resources From some experience we have learned that works of the popular natural history class are not written with the view of being criticized; indeed, it would appear to be scarcely fair to subject them to any such ordeal, at least from a scientific point of view. A compiler who had a good working knowledge of, say, the mammals and birds, would be a more or less exceptional creature; if he knew something of the whole group of the Vertebrates, he would be far out of the common; but even such a one would flounder when he came to treat of the remaining great groups; we laugh at Oliver Goldsmith's "Animated Nature," but a learned entomologist might be as ignorant of the Vertebrates and the Mollusca as Goldsmith was of the difference between a cow and a horse. Therefore instead of criticism, we venture to think that commiseration were the more needed, and perhaps to this the advice might be added to beware not to repeat the folly.

In the "Natural History of the Animal Kingdom," for the use of young people, as adapted from the German of Prof. von Schubert, by Mr. W. F. Kirby, there are no such absolute blunders as are to be met with in Goldsmith's work; its shortcomings are more in the direction of omissions and lack of explanation of technical terms. If the adapter had handed say the first part, "On Mammals," to some young and fairly intelligent youth, and then examined him about what he read, he would probably have been astonished at the result; we tried the experiment, the critic perversely turned to the last page, about the "duckbill and spiny anteater," the position of the marsupial bones (nowhere described as having any connection with the pouch) puzzled him, and his ideas fell far from realizing the fact, but when he came to the description of the cavity of the mouth of the duckbill as "a closed weir," his speculations became hopelessly absurd, and we inquired no further. Mr. Kirby, we feel, is not accountable for the illustrations, which may amuse many, possibly instruct some.

The next time the Society makes an attempt in this direction we hope it will succeed better.

OUR BOOK SHELF.

Commercial Botany of the Nineteenth Century. By John R. Jackson, A.L.S. (London: Cassell and Co., 1890.)

THE general public are so little aware of the sources and history of the many familiar vegetable products which they use daily, that a short description of them in a readable form will naturally be welcome. To provide this is the object of the little book under review: it contains within its 160 pages an epitome of the results achieved by Kew and the colonial gardens in vegetable economics during the present century. The more important attempts to introduce plants of commercial value into new areas, their success or failure, and the consequent effect upon the imports of raw materials, and the prices of manufactured articles are discussed. The facts, in themselves interesting enough, will appeal with additional weight to the reader since they come from head-quarters, the author being the Curator of the Museums in the Royal Gardens at Kew.

Mr. Jackson has wisely avoided the dictionary form, which makes books of this nature so dry and disconnected. He has devoted separate chapters to distinct classes of products, *e.g.* india-rubber, drugs, oils, dyes, fibres, &c., each chapter thus gives a succinct account of the steps taken to advance the interests of a separate industry. Perhaps the most interesting are the pages which describe the rise and progress of the trades in india-rubber (pp. 10-26) and quinine (pp. 60-71); these illustrate admirably the methods pursued by the Directorate of Kew, and it is highly desirable that such statements should be put before the general reading public. It is desirable, not merely for their information in matters which more or less directly concern every one of them, but in order that they may duly appreciate the importance of the work carried on by Kew, in the introduction of economic plants into new areas, and the effect which such experiments have already had upon supply and prices. Mr. Jackson is to be congratulated on having produced a book at once short, interesting, and useful: the facts which he puts forward so closely affect the whole community that they lose little or nothing in weight by the plainness of the style in which the book is written.

F. O. B.

Fresenius's Quantitative Analysis. Translated by Chas. E. Groves, F.R.S. Vol. II., Part 3. (London: J. and A. Churchill.)

THIS third part is especially welcome after the long time that has elapsed since the second was to hand, as we hope it indicates that the rest of the volume is likely to follow without delay. The present part continues the subject of acidimetry, and goes on to alkalimetry, compounds of the alkalies, and alkaline earths (including bleaching powder), aluminium compounds, silicates, and chromium and zinc ores.

The Design of Structures. By S. Auglin, C.E. (London: Charles Griffin and Co., 1891.)

THIS work can be confidently recommended to engineers. The author has wisely chosen to use as little of the higher mathematics as possible in his treatment of the different branches of the subject, and has thus made his work of real use to the practical engineer. It must not be imagined that the author has not thoroughly dealt with his subject. The work is a very good example of the way in which the subject can be adequately treated without the use of abstruse formulæ and complicated calculations. In a volume of 500 pages, we find most of the usual points dealt with, and illustrated by a large number of practical examples such as occur in the every-day experience of the engineer.

The volume is divided into thirty-one chapters, and

©1891 Nature Publishing Group

concludes with a good index. Although the work has been designed for students of engineering and architecture—at least this is the modest claim of the author—he also hopes that it may prove a useful book of reference to those engaged in the profession generally. There is little doubt that these hopes will be fulfilled, for after careful perusal we have nothing but praise for the work.

On pp. 409 and 414, "Mr. B. Baker" is quoted. In a future edition it will be as well to give this eminent engineer his proper title. N. J. L.

LETTERS TO THE EDITOR.

[The Editor does not hold himself responsible for opinions expressed by his correspondents. Neither can he undertake to return, or to correspond with the writers of, rejected manuscripts intended for this or any other part of NATURE. *No notice is taken of anonymous communications.]*

Prof. Van der Waals on the Continuity of the Liquid and Gaseous States.

I CANNOT but think that my friend Mr. Bottomley is a little hard on Prof. Van der Waals. I am not aware that there is any dispute as to the fact that the methods he employed are open to criticism, and that his formula is only approximately true. In spite of its defects the treatise was regarded by Maxwell at the time of its publication as of very great interest. If, however, Van der Waals is accused of not showing a "proper appreciation of the work of Andrews," the following facts should be considered before judgment is passed:—

(1) The celebrated Bakerian Lecture of Andrews is not directly referred to, but the full account of it which appeared in *Poggendorff's Annalen* (Ergänzungsband v. p. 64, 1871) is quoted (p. 406).

(2) This reference is followed by a long section headed "Experiments of Andrews" (p. 407).

(3) On p. 420 the following passage occurs:—"The signification of the temperature—the critical temperature of Andrews—is clear from what precedes. Below it the substance can exist in the so-called gaseous as well as in the so-called liquid state, &c. The honour of this remarkable discovery, which alters our views as to the so-called permanent gases, and the liquefaction of gases generally, belongs to Andrews. That it was not so easy to reach this conclusion from experiments appears, amongst other circumstances, from Regnault giving in good faith maximum pressures for carbonic acid above 40°."

(4) The phrase, "I have borrowed this remark from Maxwell," which follows the description of the continuous transformation from gas to liquid, is at all events a proof that Van der Waals did not claim priority in the conception of the possibility of such a transformation.

He can therefore have had no possible reason for desiring to credit Maxwell, rather than Andrews, with this idea, especially in view of the facts that Maxwell himself (p. 119, first edition, "Theory of Heat") laid no claim to it, and that it is most clearly expressed in the abstract of the work of Andrews (*Pogg. Ann., loc. cit.*), to which Van der Waals himself refers his readers.

(5) The preface is not happily worded, but I think that the phrases employed do not necessarily bear the interpretation which Mr. Bottomley attaches to them.

The context shows that the "connection between the gaseous and liquid condition," which Van der Waals claims to have established, is not the possibility of a continuous transformation from one to the other through a series of stable states, but that "both portions of the isotherms belong to one curve, even in the case in which these portions are connected by a part which cannot be realized."

He is referring to the work of James Thomson, not to that of Andrews, and his claim, as I read it, is to have deduced "from theoretical considerations" a form of the isothermal which, as the passage on p. 416 shows, he fully admits that James Thomson was the first to suggest and to support by sound argument. Again, I do not understand that Van der Waals claims to be the originator of the "conception" of the continuity of the liquid and gaseous states. He only says that his conception of their *identity*, which, in the sense in which he uses the word, he admits to be doubtful, has proved a "fruitful" hypothesis. He defines *identity* to mean that the molecule is not more complex in the liquid than in the vaporous state. His calculations are based on this assumption, and he fully admits that they only apply in cases where it is justified.

While, then, I agree with Mr. Bottomley that an explicit tribute in the preface to Andrews and to James Thomson would have been graceful on the part of Van der Waals, I do not think that there is any evidence of an attempt to claim for himself credit which is due to others. A. W. RÜCKER.

SINCE my letter which was published in your last issue was written, I have found that the first edition of Maxwell's "Theory of Heat" contains a diagram, intended to represent the isothermals of carbonic acid substance, with all, or almost all, the faults of the diagram of Prof. Van der Waals; and from this, no doubt, Van der Waals's diagram was taken. Consequently I beg leave to withdraw absolutely the words used in my letter, viz. "The curves seem certainly not taken from Maxwell," and also a succeeding sentence which gave my reason for this opinion. I am sorry for my error; but I was not aware, or rather had quite forgotten, that Maxwell's first edition contained this faulty diagram.

My criticism of Van der Waals's essay is in no way altered, however, unless perhaps it is a little strengthened. Maxwell became alive to the faultiness of his diagram, at any rate prior to 1875, and corrected it. Unfortunately, Prof. Van der Waals and the translators had not reached a clear understanding of the physical meaning of these curves in 1890, even with the aid of Maxwell's second edition. J. T. BOTTOMLEY.

13 University Gardens, Glasgow, March 10.

Surface Tension.

I SHALL be obliged if you can find space for the accompanying translation of an interesting letter which I have received from a German lady, who with very homely appliances has arrived at valuable results respecting the behaviour of contaminated water surfaces. The earlier part of Miss Pockels' letter covers nearly the same ground as some of my own recent work, and in the main harmonizes with it. The later sections seem to me very suggestive, raising, if they do not fully answer, many important questions. I hope soon to find opportunity for repeating some of Miss Pockels' experiments. RAYLEIGH.

March 2.

Brunswick, January 10.

MY LORD,—Will you kindly excuse my venturing to trouble you with a German letter on a scientific subject? Having heard of the fruitful researches carried on by you last year on the hitherto little understood properties of water surfaces, I thought it might interest you to know of my own observations on the subject. For various reasons I am not in a position to publish them in scientific periodicals, and I therefore adopt this means of communicating to you the most important of them.

First, I will describe a simple method, which I have employed for several years, for increasing or diminishing the surface of a liquid in any proportion, by which its purity may be altered at pleasure.

A rectangular tin trough, 70 cm. long, 5 cm. wide, 2 cm. high, is filled with water to the brim, and a strip of tin about 1½ cm. wide laid across it perpendicular to its length, so that the under side of the strip is in contact with the surface of the water, and divides it into two halves. By shifting this partition to the right or the left, the surface on either side can be lengthened or shortened in any proportion, and the amount of the displacement may be read off on a scale held along the front of the trough.

No doubt this apparatus suffers, as I shall point out presently, from a certain imperfection, for the partition never completely shuts off the two separate surfaces from each other. If there is a great difference of tension between the two sides, a return current often breaks through between the partition and the edge of the trough (particularly at the time of shifting). The apparatus, however, answers for attaining any condition of tension which is at all possible, and in experiments with very clean surfaces there is little to be feared in the way of currents breaking through.

I always measured the surface tension in any part of the

©1891 Nature Publishing Group